ABSTRACT

A premixed charge compression ignition engine, and a control system, is provided which effectively initiates combustion by compression ignition and maintains stable combustion while achieving extremely low nitrous oxide emissions, good overall efficiency and acceptable combustion noise and cylinder pressures. The present engine and control system effectively controls the combustion history, that is, the time at which combustion occurs, the rate of combustion, the duration of combustion and/or the completeness of combustion, by controlling the operation of certain control variables providing temperature control, pressure control, control of the mixture's autoignition properties and equivalence ratio control. The combustion control system provides active feedback control of the combustion event and includes a sensor, e.g. pressure sensor, for detecting an engine operating condition indicative of the combustion history, e.g. the start of combustion, and generating an associated engine operating condition signal. A processor receives the signal and generates control signals based on the engine operating condition signal for controlling various engine components to control the temperature, pressure, equivalence ratio and/or autoignition properties so as to variably control the combustion history of future combustion events to achieve stable, low emission combustion in each cylinder and combustion balancing between the cylinders.